

Office Action Summary

Application No.

09/472,079

Applicant(s)

YAMAZAKI, SHUNPEI

Examiner

Vikki H Trinh

Art Unit

2814

— The MAILING DATE of this communication appears on the cover sheet with the correspondence address —
 Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 November 2002.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 2, 5-21, 24, 27 and 30-41 is/are pending in the application.
- 4a) Of the above claim(s) 10-17 and 37-41 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2 and 5-9 is/are rejected. 10-21, 24, 27, 30-36
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1, 2, 5-21, 24, 27 and 30-41 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
 If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application)
 a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 12.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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DETAILED ACTION

Election/Restrictions

1. Newly submitted claims 37-41 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: the gate insulating film/layer comprises silicon oxynitride boron.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 37-41 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2 are rejected under 35 U.S.C. 102(b) as being anticipated by Sukegawa (JP 04367277).

With respect to claims 1-2, Sukegawa (JP 04367277) discloses semiconductor device, TFT, having a gate electrode 2 formed on an insulating surface 1; a gate insulating film 3 formed on the gate electrode; and a source region 7, a drain region 6, and a channel 9 forming region between the source region and the drain region, all these regions formed on and in contact

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with the gate insulating film; wherein the gate insulating film has one layer of a silicon nitride film 8 containing boron. (The examiner notes that similar to SiN gate insulating film 3, SiN film 8 is also a good insulator.) See abstract.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sukegawa (JP O 4367277) in view of Nguyen et al. (5536360). ✓

In the abstract, Sukegawa (JP O 4367277) discloses a TFT having a gate electrode 2 formed on an insulating surface 1; a gate insulating film 3 formed on the gate electrode; and a source region 7, a drain region 6, and a channel 9 forming region between the source region and the drain region, all these regions formed on and in contact with the gate insulating film; wherein the gate insulating film has one layer of a silicon nitride film containing boron 8. However, Sukegawa (JP O 4367277) does not explicitly teach the atomic % ratio of boron composition to silicon nitride.

In column 4, table, Nguyen et al. '360 discloses the % atomic composition of each of the elements in the silicon boronitride. Thus it is inherent that the ratio of the boron composition to silicon nitride is within the range of the claimed subject matter.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to construct composition of the silicon boronitride of Sukegawa (JP O 4367277) with

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a range of atomic % ratio of boron composition to silicon nitride, as taught by Nguyen et al., so as to clearly define the composition of each element in the compound.

Claims 6-9, 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sukegawa (JP O 4367277), as applied to claims 1-2, in view of Yamazaki et al. (JP 0135468).

Sukegawa (JP O 4367277) discloses the invention substantially as claimed in the above. However, Sukegawa does not teach the use of the semiconductor device in an optical environment such as liquid crystal display, EC display, EI display, and image sensor.

In figure 19, Yamazaki et al. (JP 10135468) teaches TFT being used for optical devices.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to construct the invention of Sukegawa with optical devices, liquid crystal display, EC display, EI display, and image sensor, as taught by Yamazaki et al., for durability and water-reduction absorption characteristics.

Claims 1, 2, 6, 9, 21, 24, 27, 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takemura (6194254) in view of Treichel et al. (4990365).

In figure 4F, Takemura discloses a semiconductor device of TFT having an insulating layer 102, source 118 and drain 119 formed on the insulating layer 102, a channel 109 formed therebetween, another insulating layer 111, 113 therein, a gate electrode 114, 115, 116 formed on the insulating layer 111. The TFT is used for optical and electronic devices such as digital camera, video display (another words for electro optical apparatus), etc., as claimed in claims 6, 9, 21, 31. See figure 4F.

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However, Takemura does not explicitly teach the interlayers being made of silicon boronitride.

In the abstract, Treichel et al. (4990365) discloses silicon boronitride (Si_xBN) layers that are used as intermetallization layers and/or as final passivation layers for a semiconductor device. Also, see col. 1, lines 60-63.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to construct the invention of Takemura with the silicon boronitride layers, as taught by Treichel et al., so as to enhance the device durability and water-reduction absorption characteristics.

Claims 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable Takemura (6194254) in view of Treichel et al. (4990365), as applied to claims 2-3 above, and further in view of Nguyen et al. (5536360).

Takemura (6194254) in view of Treichel et al. (4990365) teach the invention substantially as claimed in the above claims 2-3. However, Takemura (6194254) in view of Treichel et al. (4990365) do not show a specific range of atomic % ratio of boron to silicon nitride.

In column 4, table, Nguyen et al. '360 discloses the % atomic composition of each of the elements in the silicon boronitride. Thus, it is inherent that the ratio of the boron composition to silicon nitride is within the range of the claimed subject matter, .1 to 50 atomic %.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to construct composition of the silicon boronitride of Takemura (6194254) in view of Treichel et al. (4990365) with a range of atomic % ratio of boron composition to silicon nitride,

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as taught by Nguyen et al., so as to clearly define the composition of each element in the compound.

Claims 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sukegawa, in view of Furuta et al. (applicant's cited reference, EPO 0566838)

Sukegawa discloses in the invention substantially as claimed. However, Sukegawa does not explicitly teach that the gate insulating film 3 is doped with boron.

Furuta et al. teaches an insulating layer 13, 22 formed over the gate electrode 12, 21., wherein the layer is doped with boron. See figures 1c, 3a, and col.3, lines 21-24, col. 5, lines 17-20.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the insulating layer 3 of Sukegawa with boron dopant, as taught by Furuta et al., so as to control threshold voltage. See col. 1, lines 15-16.

As to claims 33-34, Sukegawa and Furuta et al. do not explicitly teach a specified range of boron concentration in term of atom% for the insulating film/layer. Nonetheless, it would have been obvious to one skilled in the art at the time the invention was made to construct the insulating film/layer with a specific range of boron concentration in term of atom%, since it is a prima facie obvious of an artisan's experimentation and optimization to particularize a specific range for boron concentration because applicant has not established any criticality.

Claims 35-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sukegawa, in view of Furuta et al. (applicant's cited reference, EPO 0566838), and further in view of Yamazaki et al. (applicant's cited reference, JP 0135468). ✓

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Sukegawa (JP O 4367277) in view of Furuta et al. discloses the invention substantially as claimed in the above. However, Sukegawa in view of Furuta et al. does not teach the use of the semiconductor device in an optical environment such as liquid crystal display, EC display, EI display, and image sensor.

In figure 19, Yamazaki et al. (JP 10135468) teaches TFT being used for optical devices.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to construct the invention of Sukegawa in view of Furuta et al. with optical devices, as taught by Yamazaki et al., for durability and water-reduction absorption characteristics.

Response to Arguments

2. Applicant's arguments filed 11/02/02 have been fully considered but they are not persuasive.

In applicant's remarks regarding to Sukegawa reference, applicant contends that Sukegawa's layer 8 is not a gate insulating layer because the layer has a discontinuous portion. (See Remarks, page 6, third paragraph.) The examiner notes that the Sukegawa applies to the present claims according to the language of the claims. Layer 8 being formed over the gate electrode comprises an insulating material, hence a gate insulating layer. Whether a layer including a separated portion constitutes a gate insulating layer is not an issue for applying a reference in rejecting a claim. Therefore, the rejections using Sukegawa are proper. The examiner notes the inadvertent typo with respect to the reference number of Sukegawa.

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With respect to Treichel, applicant contends that Treichel does not teach the deficiency of Takemura. On the contrary, Treichel does teach the deficiency in Takemura, so that the combined teaching of the references is appropriate. See the above rejection.

The examiner has reconsidered the provisional double patenting rejection.

Conclusion

1. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Vikki Trinh whose telephone number is (703) 308-8238. The Examiner can normally be reached Mon-Tuesday, Thurs-Friday, 7:30 AM - 6:00 PM Eastern Time. If attempts to reach the examiner by telephone are unsuccessful, the Examiner's supervisor, Mr. Wael Fahmy, can be reached at (703) 308-4918. General inquiries relating to the

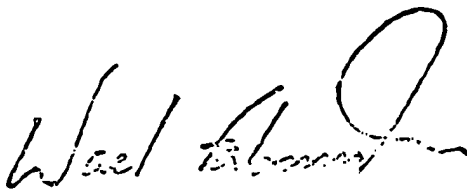
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status of this application should be directed to the Group receptionist at (703) 308-0858. The fax number is (703) 308-2708.

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SUPERVISOR
TECHNOLOGY CENTER